

SURFACE MODIFICATION AND CHARACTERIZATION RESEARCH CENTER

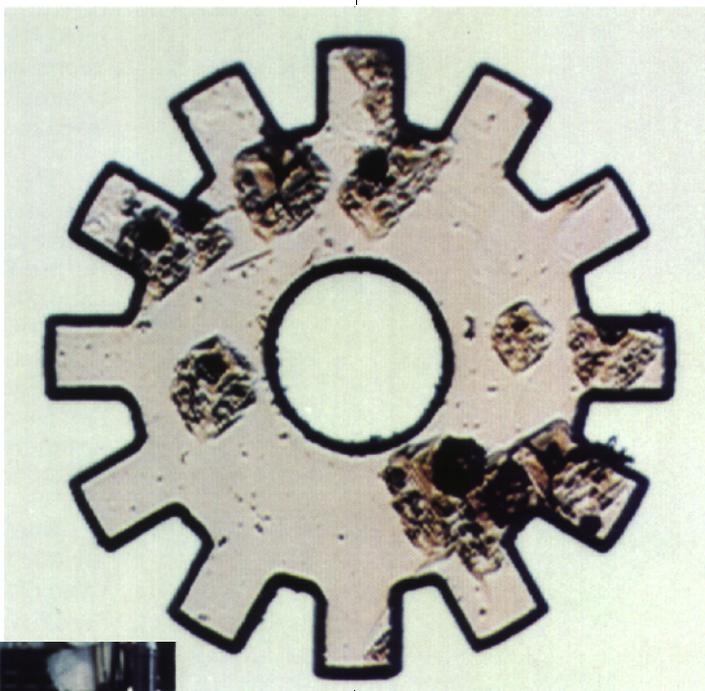
The Surface Modification and Characterization (SMAC) Research Center is a unique facility at Oak Ridge National Laboratory for the alteration and characterization of the near-surface properties of materials.

With SMAC equipment, researchers can alter the physical, electrical, and chemical properties of solids to create unique new materials not possible with conventional "equilibrium" processing techniques. Surface modification is achieved using techniques such as ion implantation doping, ion beam mixing, low-energy ion deposition, and ion beam annealing. These ion beam based techniques are suitable for tailoring desired modifications in many different classes of materials, including metals, semiconductors, ceramics, insulators, polymers, and even biological samples.

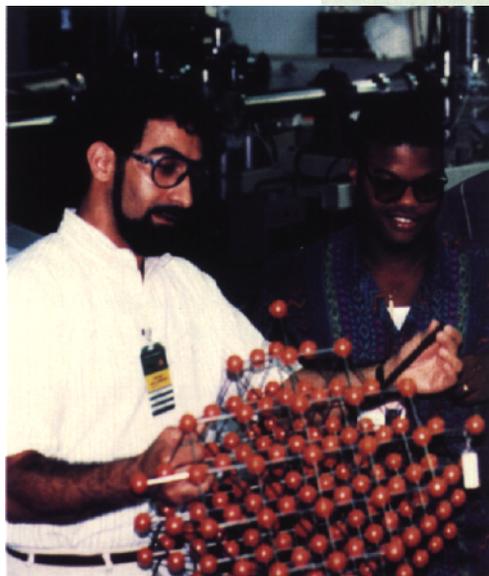
Changes in surface properties as a result of ion beam processing by these techniques can be characterized at the facility using ion scattering analysis, ion channeling, nuclear reaction analysis, and other surface and bulk-sensitive techniques.

The Center features four ion accelerators that provide a wide range of implantation and ion scattering capabilities. These accelerators are integrated

with computer-monitored beam lines, experimental chambers, and data acquisition electronics. Additional capabilities include annealing, thin-film evaporation, optical microscopy, and nanoindentation hardness. Surface analytical equipment, including Auger electron spectroscopy and low-energy electron diffraction, is available on some experimental chambers.



Micromechanical devices, such as this 400 micron diameter diamond gear, can be easily manufactured using the ion beam liftoff technique developed as a collaborative project in the SMAC facility.



Alabama A&M Professor Daryush Ila explains to graduate student Melvin Spurlock the concept of ion channeling in a SMAC experiment.